Antimicrobial Copper

Economics and case studies

Healthcare, Environment and Infrastructure

Stamford Bridge, London

4th December 2013

STAND 130

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Antimicrobial Copper Cu+ ™

Version 1.4

Content

01.00 Introduction & context

Europe – some headline numbers

HCAIs… infections resulting from healthcare interventions

- 7.1% overall prevalence rate – over 4.1 million patients affected
- Up to 51% prevalence in Intensive Care Units (ICUs)
- 16 million extra days in hospital
- Direct costs: €7 billion
- 37,000 deaths directly caused by HCAIs
- Additional 110,000 deaths where HCAIs contributory factor

Source: WHO - The Burden of Health Care-Associated Infection Worldwide – A Summary. 2011
WHO - European Health for All Database (HFA-DB)

HCAIs – Influence of the environment

- There has been little evidence of the role of environmental microbial contamination in HCAI acquisition

  – **but that is changing:**

  - proposals for acceptable levels of microorganisms in the clean environment are being developed – transferred from the food industry
  - there is an increasing awareness of the role of touch surfaces in transmitting infection, evidenced by an increasing number of research papers on the topic
  - **Infection Control and Hospital Epidemiology** published a Special Topic Issue: The Role of the Environment in Infection Prevention (May 2013)

1983

Doorknobs: a source of nosocomial infection?

This hospital study is a reminder of the often ignored fact that brass is bactericidal, while stainless steel is not.

PHYLLIS J. KUHN, PhD

Sleek and shining stainless steel doorknobs and push plates look reassuringly clean on a hospital door. By contrast, doorknobs and push plates of tarnished brass look dirty and contaminating. But even when tarnished, brass—an alloy typically of 67% copper and 33% zinc—is bactericidal, while stainless steel—about 88% iron

vestigation of bacterial growth on metal, small strips of stainless steel, brass, aluminum, and copper were inoculated with broths of *Escherichia coli*, *Staphylococcus aureus*, *Streptococcus* group D, and *Pseudomonas* species. The broths contained approximately 10^7 bacteria/ml, a very heavy inoculum. Then the strips were air-dried for 24

tion, brass and copper
covered with seeded aga
bated in culture for 24
cause the metals are t
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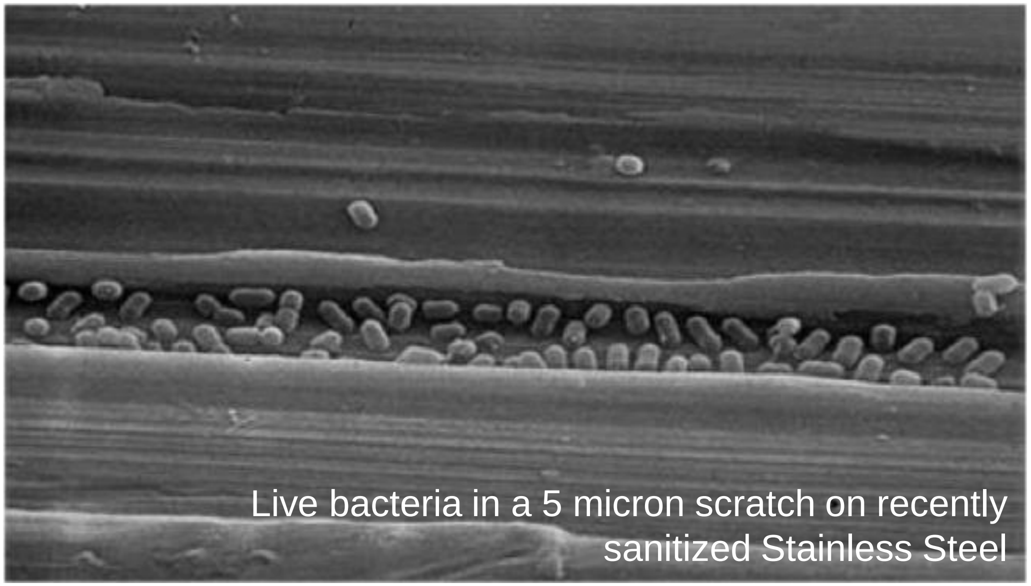
the strips, but instead, t
bacteria piled up by th
the strips. Why? Accord
Arndt-Shultz law, low le
sons tend to stimulate b

Why touch surfaces?

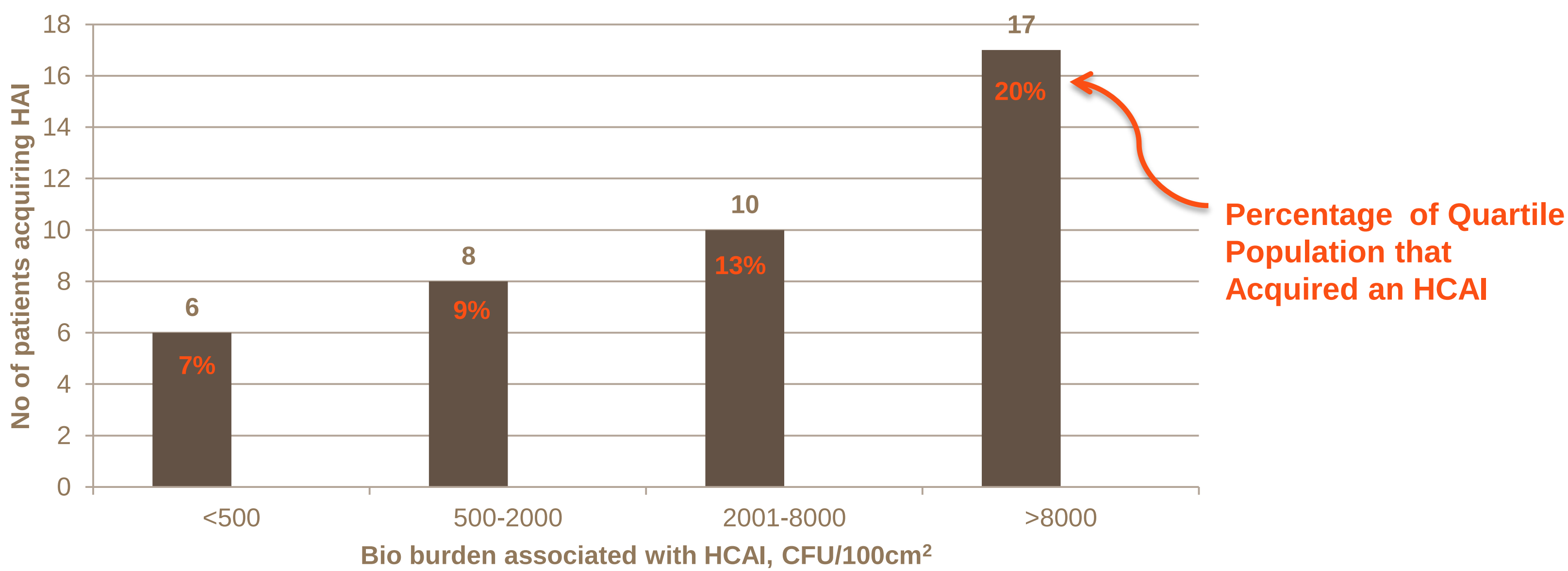


Live bacteria in a 5 micron scratch on recently sanitized Stainless Steel

As shown above, just because touch surfaces are cleaned does not mean they are really clean. In addition, as a contaminated hand will spread germs to the next seven surfaces touched[2], having an inactive surface offers no protection against recontamination and the spread of microbes.

Professor Schmidt's team has published data providing insights

- There was a reduction in HCAIs in copper rooms: 10 (3.40%) v 26 (8.12%); p= 0.013
- Of the 4,450,545 bacteria recovered during the trial, only 17%, rather than an expected 50%, were isolated from rooms with copper objects
- Acquisition of HCAIs was linked to bioburden:



Copper Surfaces Reduce the Rate of Healthcare-Acquired Infections in the Intensive Care Unit. Salgado CD et al. ICHE Special Topic Issue: The Role of the Environment in Infection Prevention. May 2013

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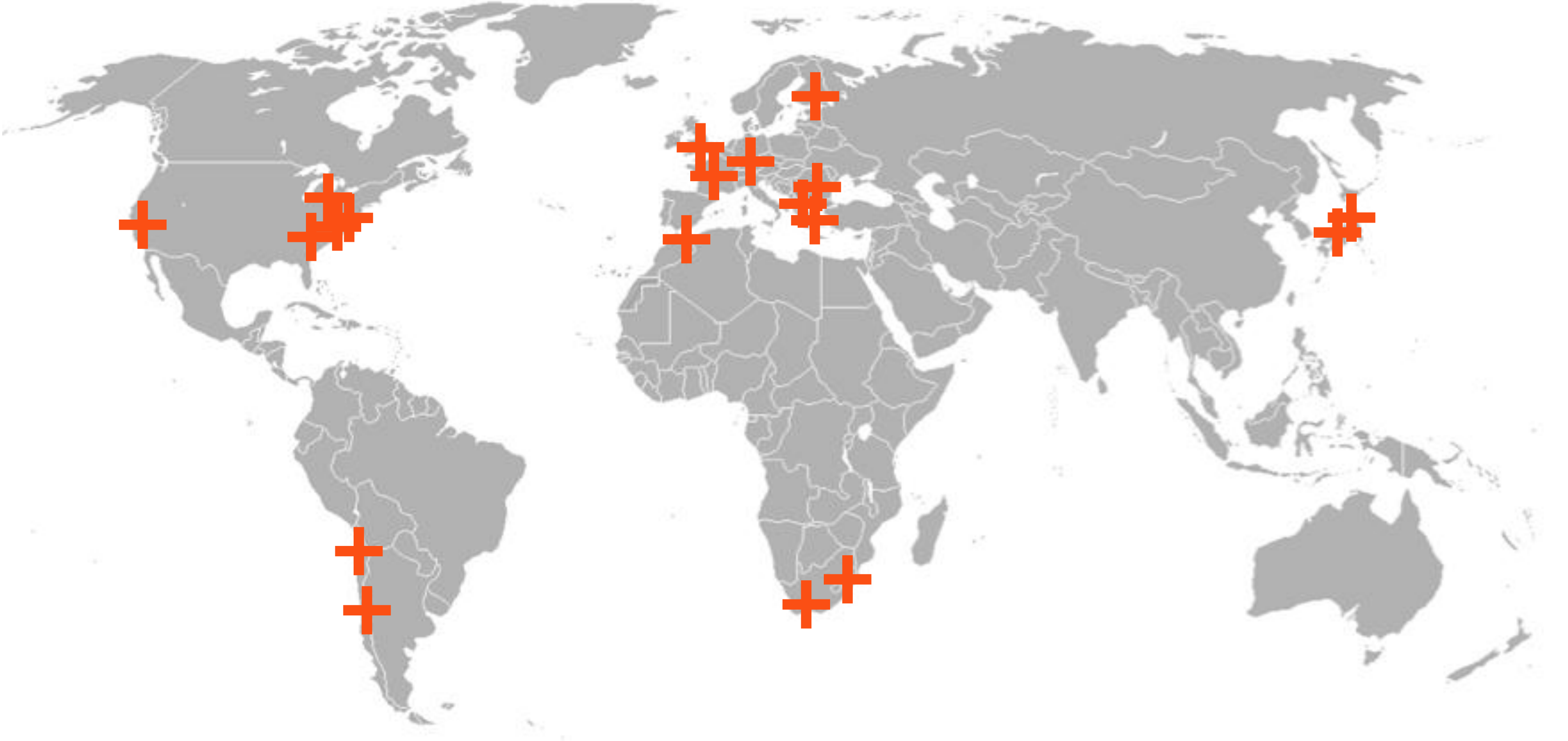
02.00 Clinical evidence and case studies

Independent clinical trials have been conducted at multiple locations around the world



Fighting infections is a multifaceted challenge

- Antimicrobial Copper needs to be seen as a **supplement** to, not a substitute for, standard infection control practices.
- One must continue to follow all current practices, including those related to cleaning and disinfection of environmental surfaces.
- Antimicrobial Copper is compatible with hospital cleaning agents.
- Antimicrobial Copper alloy surfaces must not be waxed, painted, lacquered, varnished, or otherwise coated. The alloys oxidize to varying degrees, which does not impair their antimicrobial efficacy.

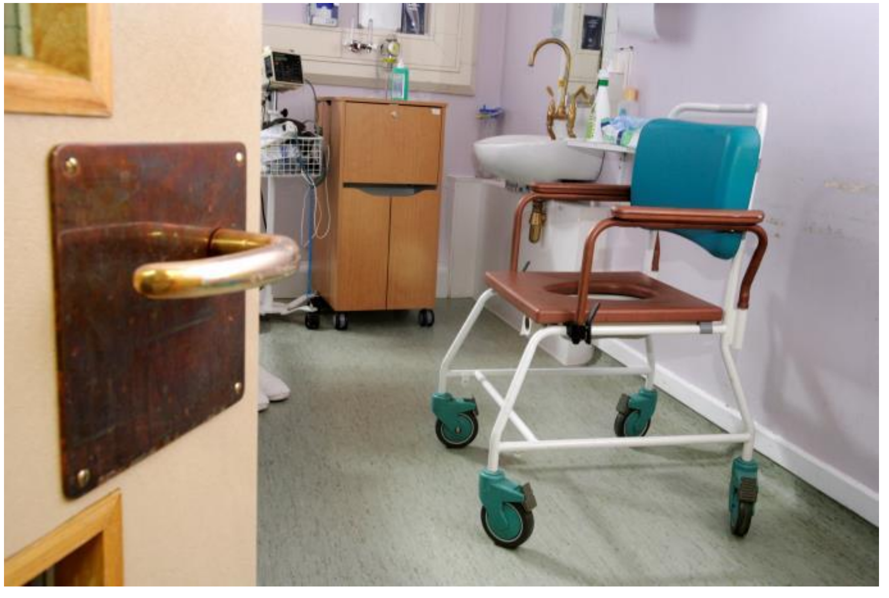
University Hospitals Birmingham, NHS Foundation Trust

Selly Oak clinical trial - UK

University Hospitals Birmingham NHS
NHS Foundation Trust

UHB, NHS Foundation Trust

Selly Oak clinical trial - UK



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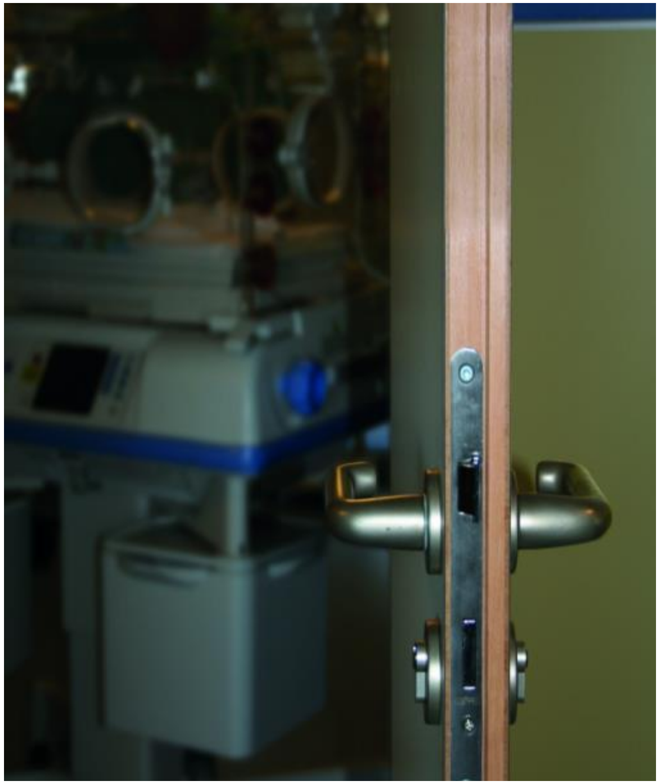
UHB, NHS Foundation Trust

Selly Oak clinical trial - UK

University Hospitals Birmingham NHS
NHS Foundation Trust

AKH Hagen, Germany – children's ICU



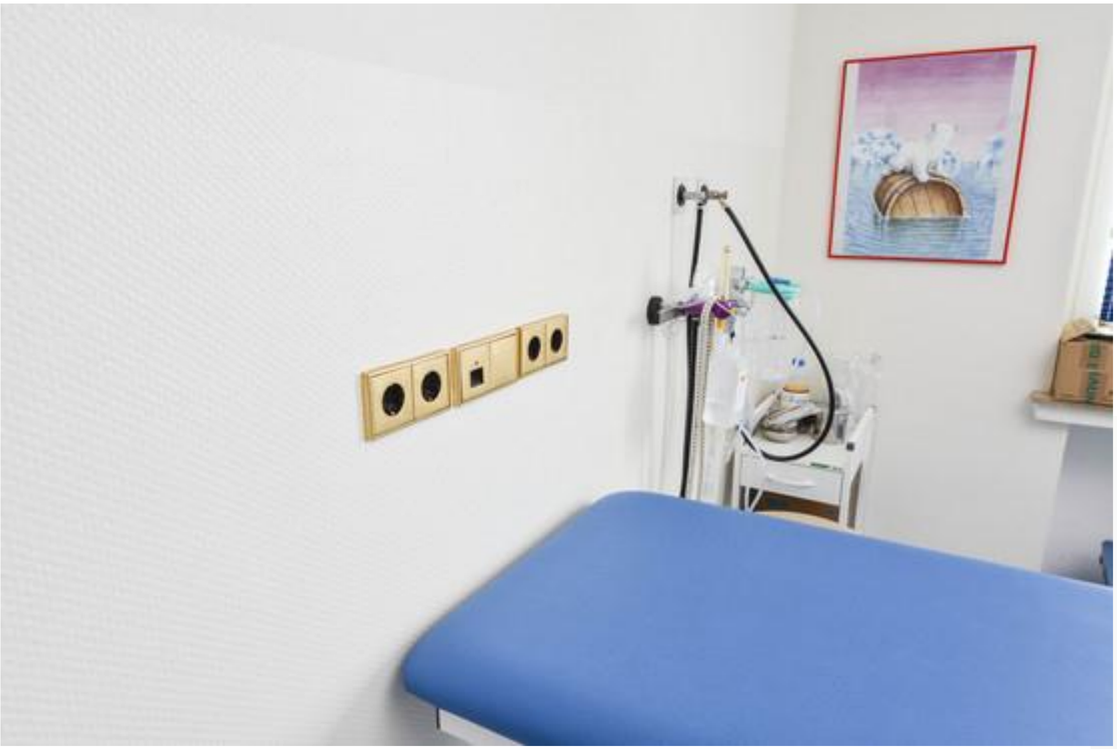
Images courtesy of Deutsches Kupferinstitut and N. Passoth

AKH Hagen, Germany – children's ICU

Allgemeines Krankenhaus Hagen
Medizinische Kompetenz
AKH
Mittelpunkt Mensch
Diakonie

Images courtesy of Deutsches Kupferinstitut and N. Passoth

AKH Hagen, Germany – children's ICU



AKH Hagen, Germany – children's ICU

Reinhard Tennert, Director of AKH:

"It is important for us to get ahead with investing in supplementary hygiene measures, and to therefore be able to offer our youngest patients the best possible protection against infections carried by germs.

Cases of illness resulting from a lack of hygiene are **unethical**, **extremely expensive** due to treatment costs of up to a quarter of a million Euros per case of treatment, and furthermore have a negative effect on the **image** of the whole organisation."

Homerton University Hospital, London, UK

Homerton University Hospital NHS
NHS Foundation Trust

Homerton University Hospital, London, UK

Homerton University Hospital NHS
NHS Foundation Trust

Roberto del Rio Children's Hospital, Chile

- Paediatric Hospital

Roberto del Rio Children's Hospital, Chile

- Paediatric Hospital

Roberto del Rio Children's Hospital, Chile

Doctor Ignacio Hernandez, Director of Roberto del Rio:

“This initiative will benefit children who are hospitalised in critical conditions as they will be in a healthier environment.”

The future?

03.00 What about cost?

An Economic Evaluation of the use of Copper in Reducing the Rate of Healthcare Associated Infections in the UK

Presented at:

- WHO International Infection Control Conference, Geneva (ICPIC 2013)
- The International Society for Pharmacoeconomics and Outcomes Research, Dublin (ISPOR 2013)

Providing Consultancy &
Research in Health Economics

THE UNIVERSITY of York
INVESTORS IN PEOPLE
YHEC
York Health Economics Consortium

The Business Case for Copper

- YEHC - Global leader in healthcare associated modelling
- Model developed to calculate payback for upgrading to copper
- Allows input of local HCAI rates and costs
- Works in £, € or $
- Fully referenced model

YHEC

York Health Economics Consortium

Example: 20-bed ICU, new build, UK

YHEC
York Health Economics Consortium

Title Sheet

Inputs

Calculations

Results

Model Inputs

Set-Up | Effectiveness | Cost | Resource Use | References

The purpose of this sheet is to set up the model for the appropriate hospital setting. The typical number of patie
entered in the cells shaded in green. Whether or not copper items will be introduced to general wards, ICU or s
pathogen in the model can be entered in the appropriate green shaded cell .

Number of beds in unit	20
Average length of stay in ICU (days)	5.7
Average length of stay ward/single room (days)	3.0
Calculated number of patients per year (Cohort)	1,200
Yearly change in number of patients	0%

Setting	ICU

Infection to be included in the model:	All Healthcare Associated Infections

Currency:	Euro (I)

Example: 20-bed ICU, new build, UK

Outcome and length of stay in different European and North American ICUs. Results from the European/North American scoring multicenter study in 137 ICUs with 13,152 intensive care patients (51)

Country	ICU Patients (n)	Mortality Rate (%)	Length of ICU Stay (days)	Length of Hospital Stay (days)***	Mean Score SAPS II	Mortality Observed/Expected
Belgium	1,091	21.7	6.2	21.5	0.9	1.12
Finland	720	17.6	4.1	14.0	31.0	0.88
France	1,393	28.9	9.7	18.9	40.5	0.92
Germany*	1,807	15.7	6.0	21.0**	30.3	0.9
Italy	1,297	31.3	7.2	20.5	38.6	1.07
Spain	1,270	27.1	9.5	22.8	32.2	1.31
Switzerland	756	13.8	4.9	17.6	30.7	0.74
The Netherlands	950	20.0	5.5	19.3	31.3	1.02
United Kingdom	136	32.4	5.7	14.8	42.1	0.96
U.S./Canada	3,732	19.7	5.9	17.1	32.1	0.96
Total	13,152	21.8	6.6	19.1	33.2	0.99

* Including one ICU from Austria
** The average length of stay in German hospitals is about 14 days
*** No. of days in hospital from beginning of ICU stay

YHEC York Health Economics Consortium
Antimicrobial Copper Cu+

Example: 20-bed ICU, new build, UK

YHEC
York Health Economics Consortium

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The following infection rates are taken from published papers. To change to hospital specific rates, the rate and the time period in should be entered into the appropriate cells and 'user defined data' should be selected in the drop down menu. A new monthly rate

	Montl				
	ICU				
	Rate	Time period (months)	Monthly rate	Rate	T
All healthcare associated infections — User defined data	15.000%	12	0.0125		
Cairns *et al*. 2010	27.100%	12	0.0226		
Health Protection Agency 2011	23.400%	12	0.0195		
User defined data	15.000%	12	0.0125		

Reduction in infections*	20.0%

**Rates from Salgado (2013) showed a reduction of 58.1% for the copper arm versus non-copper arm. A conservative assumption*

Example: 20-bed ICU, new build, UK

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Title Sheet

Inputs

Calculations

Results

Model Inputs

Set-Up → Effectiveness → Cost → Resource Use → References

This sheet is used to calculate the cost of an infection and the copper intervention. Costs included are the unit cost for one additional day the pat GP and outpatient costs after leaving hospital. (The number of excess hospital days, GP visits and outpatient visits that a patient may need are e equipment are for those used in the Salgado study. Optional copper items can also be added but it should be noted that this only adds to the cos account any additional benefit given the clinical evidence currently available.

	Unit cost
Cost of an additional day in hospital due to infection	€ 1,000
Visit to general practitioner	€ 0
Outpatient	€ 0

Cost of equipment

		Unit Cost		Number required	Total cost	
		Copper	Baseline		Copper	Baseline
Bed rails sets		€ 5,360	€ 4,020	20	€ 107,200	€ 80,400
Overbed tray table		€ 402	€ 201	20	€ 8,040	€ 4,020
Chair		€ 469	€ 335	20	€ 9,380	€ 6,700
Call button		€ 67	€ 27	20	€ 1,340	€ 540
Data device		€ 335	€ 134	20	€ 6,700	€ 2,680
IV pole		€ 402	€ 268	20	€ 8,040	€ 5,360
Optional copper items						
Grab rails	☐					
Lever handle set	☐					
Push plates set	☐					
Cistern handle	☐					
Tap set	☐					
Other 1	☐					
Other 2	☐					
Other 3	☐					
Other 4	☐					
Other 5	☐					
Other 6	☐					

Example: 20-bed ICU, new build, UK

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- Title Sheet
- Inputs
- Calculations
- Results

Model Inputs

Set-Up > Effectiveness > Cost > Resource Use > References

This sheet is used to enter the resources a patient will use as a result of acquiring an infection. These are extra days in hospital and subsequent visits to a GP and/or an outpatient visit. These resources are assumptions and should be changed to reflect local care pathways

Resource use for an event

	Extra days in hospital	General practitioner visit	Follow up outpatient visit
All Healthcare Associated Infections	6	1	1

Example: 20-bed ICU, new build, UK

5 year results

	Copper	Baseline	Incremental
Total cost (excluding cost of infections)*	€ 140,700	€ 99,700	€ 41,000
Number of infections	720	900	180
Cost per infection averted (excluding cost of infections)			€ 227.78
Total QALYS gained			64.44
Cost per QALY			€ 636.25
Cost of infections*	€ 4,320,000.00	€ 5,400,000.00	-€ 1,080,000.00
Total cost of intervention*	€ 4,460,700.00	€ 5,499,700.00	-€ 1,039,000.00
Cost per infection averted			Dominant

*These are direct costs to the hospital (no GP costs or societal costs have been included in the model)

Number of bed days saved per year	216
Cost per bed day day saved per year	€ 189.81

The number of bed days saved per year is 216, this would allow an increased capacity in the ICU by 38 beds with a typical length of stay of 5.7 days.

Return on investment	< 3 months

The cost of the copper upgrade is €140,700 compared to €99,700 for installation of non-copper items. There were 720 infections in the copper group over the period and 900 in the baseline. This results in a cost per infection averted of €227.78.

These results are based on the following scenario:

Number of beds per unit	20
Number of patients per year	1,200
Setting	ICU
Percentage reduction in infections	20.0%
Type of infection	All Healthcare Associated Infections

Example: 20-bed ICU, new build, UK

factor	reference	example
HCAI rate in ICUs	25%	**15%**
reduction in HCAIs	58%	**20%**
pay back time		**< 3 months**
no of bed days saved per year		**216**
cost per bed day saved per year		**€189.90**

Example: 20-bed ICU, new build, UK

factor	reference	example 1	example 2
HCAI rate in ICUs	25%	15%	**25%**
reduction in HCAIs	58%	20%	**20%**
pay back time		< 3 months	**< 1 month**
no of bed days saved per year		216	**360**
cost per bed day saved per year		€189.90	**€113.90**

04.00 Conclusion & next steps

Antimicrobial Copper

5 reasons to install Antimicrobial Copper touch surfaces

1. A supplement to standard hygiene practices
2. Continuous and significant bioburden reduction
3. Improved patient outcomes
4. A simple, cost-effective intervention
5. Payback in less than one year

Home | Why Antimicrobial Copper? | Scientific Proof | Markets and Applications | Find Products and Partners | News and Download Centre | Supply Chain Resources

- Antimicrobial Efficacy
- How it Works
- Public Health Claims
- Clinical Trials
- Laboratory Testing
- EPA Registration
- Research Groups
- Scientific References

"Nearly 300,000 people acquire Healthcare Associated Infections in the UK each year."

Taylor L, Plowman R and Roberts J A, A challenge of hospital-acquired infection, National Audit Office 2001

Home > Antimicrobial Copper UK and Ireland > Scientific Proof > How it Works

The Science behind Antimicrobial Copper

Science suggests that Antimicrobial Copper kills bacteria with a multifaceted attack.

The mechanism by which Antimicrobial Copper kills bacteria is complex by nature, but the effect is simple. The questions and answers below summarise active and ongoing research seeking to explain how Antimicrobial Copper is the most effective touch surface.

How does copper affect bacteria?

Science suggests that copper surfaces affect bacteria in two sequential steps: the first step is a direct interaction between the surface and the bacterial outer membrane, causing the membrane to rupture. The second is related to the holes in the outer membrane, through which the cell loses vital nutrients and water, causing a general weakening of the cell.

How can copper punch holes in a bacterium?

Every cell's outer membrane, including that of a single cell organism like a bacterium, is characterised by a stable electrical micro-current. This is often called 'transmembrane potential', and is, literally, a voltage difference between the inside and the outside of a cell. It is strongly suspected that when a bacterium comes in contact with a copper surface, a short circuiting of the current in the cell membrane can occur. This weakens the membrane and creates holes.

Related Links

- Brochures, Presentations and Articles
- Scientific References
- Proper Use and Care
- FAQs

Contact Centre

- Book a meeting
- Request a call

Newsletter

Receive periodic emails covering breaking news, research findings, upcoming events and more..

Name:

Email:

Industry

What you can do

- take the message home: tell your executives & decision makers
- (tell the sales team)
- consider copper as a new opportunity during hospital new builds, ward or unit refurbishments
- visit anticrobialcopper.org for products & science

Keep in touch

- visit www.antimicrobialcopper.org
- sign up for newsletters (about 4 per year)
- visit us on **STAND 130**
- any feedback or questions can be sent to:

info@copperalliance.org.uk

Antimicrobial Copper

visit us on **STAND 130**

Thank you

Any questions?

Mark Tur, Technical Consultant, CDA

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